

Description

This invention relates to the field of electrical connectors and more particularly to the retention of electrical contacts within an electrical connector.

Various means and methods are known to retain pin and socket contact terminals within a dielectric housing of an electrical connector such as by using potting material, or by a spring clip held in the cavity of the housing which prevents rearward movement of the terminal. But such methods are inadequate in small connectors having very closely spaced terminals, especially where it is desired to provide for replaceability of the terminals.

At such close spacing as where the centerlines of terminals are 0.050 inches (0.127 cm) apart and where each terminal is about 0.018 inches (0.048 cm) in radius (or 0.036 inches, (0.091 cm) in diameter), very little distance remains between adjacent terminals, and conventional retention means such as housing cavity walls and individual metal clips (which are conductive) are unavailable. The use of potting compound alone would also be inadequate due to the need for very accurate placement and spacing of the terminals, or would involve uneconomical production cost.

FR—A—2 073 744 and EP—A—0 079 120 each disclose an article for retaining terminals within a housing of an electrical connector, being insertably secured in the connector and having a planar section and a plurality of holes extending therethrough each to secure therein a said terminal terminated to an electrical conductor, wherein opposing frustoconical wall sections extend partially around each hole and forwardly therefrom partly converging, the wall sections having stop surfaces on forward ends thereof for engaging a rearwardly-facing stop surface of a stop shoulder of a terminal inserted therethrough.

It is an object of the invention to provide an improved article having the features acknowledged to be known, and a method of forming such an article.

In accordance with the present invention, an article for retaining terminals within a housing of an electrical connector, being insertably secured in the connector and having a planar section and a plurality of holes extending therethrough each to secure therein a said terminal terminated to an electrical conductor, wherein opposing frustoconical wall section extend partially around each hole and forwardly therefrom partly converging, the wall sections having stop surfaces on forward ends thereof for engaging a rearwardly-facing stop surface of a stop shoulder of a terminal inserted therethrough, is characterised in that:

a first portion of the elastomeric material extends forward from said planar section and surrounds outside surfaces of the wall sections around the holes; and

a second portion of elastomeric material extends rearwardly from the planar section with holes aligned with holes extending therethrough

to a rearward end of the article into which the terminals are insertable, conductors being disposed along holes.

The invention includes a method of forming an article according to the invention comprising the steps of

forming a wafer-like article of thermoplastic material, said article having a planar section having holes therethrough and opposing wall sections associated with and extending partially around each said hole, said wall sections extending forwardly from said planar section and partly converging at a forwardly-facing end surfaces thereof;

inserting into a mold said wafer-like article and a plurality of core pins extending through the holes in said article; and

overmolding said wafer-like article with elastomeric material, thus forming a first portion of elastomeric material forwardly of said planar section such that said first portion surrounds outside surfaces of said wall sections around said holes, and a second portion of elastomeric material rearwardly of said planar section such that said second portion has holes extending therethrough formed by the core pins and aligned with said holes in said planar section.

According to an embodiment, an elastomeric material such as silicone rubber may be overmolded over the retention wafer portion to assist in retaining the wafer portion in the housing by providing spring force outwardly against the tines, to assist in retaining the terminal within the connector by providing spring force radially inwardly against the wall sections to urge them more tightly around the terminal, to provide a sealing engagement by a rearward ledge against a rearward surface of the connector housing, and to assist in sealing around the insulation of the conductor to which the terminal is terminated.

The present invention allows for close spacing of the terminals such as where the centerlines of terminals are .050 inches apart. The elastomeric overmolding allows for removal of a terminal using an extraction tool because the elastomeric material is expandable from around a conductor to allow entry of the tool from the rear of the housing.

The present invention also allows for either preloading of terminals thereinto prior to the assembly being secured in the connector housing, or securing the retention article into the housing and subsequent loading of terminals thereinto.

The present invention has another advantage in that it is also self-retaining within a housing because of large retention tines on the sides of the retention articles which engage recesses in the connector housing when fully inserted into the housing.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows a perspective view of the retention wafer portion and a terminal spaced therefrom.

Figure 2 shows a perspective view of the reten-

tion wafer portion of Figure 1 with overmolding therearound.

Figure 3 shows an enlargement of part of the retention wafer portion of Figure 1 with some wall sections broken away.

Figure 4 is a part longitudinal section of the wafer portion with overmolding.

Figure 5 is a longitudinal section view of the retention article within a connector housing, and a terminal secured therein.

Figure 6 shows an extraction tool.

Figure 7 is a longitudinal section along a retained terminal showing an extraction tool being inserted to extract the terminal from the housing of Figure 5.

Figure 8 shows the extraction tool in Figure 7 after disengaging the wall sections from around the terminal to release it.

A retention wafer portion 10 of the present invention is shown in Figure 1, made of a stiff dielectric material and preferably made of a thermoplastic material such as ULTEM (trademark of General Electric Co.) poly-etherimide resin. Wafer portion 10 has a planar section 12, large retention tines 14 extending rearwardly from sides of planar section 12 and angled outwardly. A plurality of holes 16 extend through planar section 12 such as in rows, and around each hole 16 are opposing wall sections 18 extending forwardly from planar section 12. Wall sections 18 are arcuate extending around the circumference of a hole 16 each for a substantial angular distance such as 60° to 120° and preferably 90°, tending to converge toward each other at their forward-facing forward ends 20 and form partial frustoconical shapes, the inner radius of forward ends 20 being slightly smaller than the radius of hole 16. The resilience of wall sections 18 allows for a terminal 80 being inserted through the hole 16 and having a diameter just smaller than that of hole 16, to force or urge the end 20 of wall sections 18 to the side and continue past. When terminal 80 is completely inserted through a hole 16, ends 20 of wall sections 18 have stop surfaces which will engage a rearwardly-facing stop surface of a stop shoulder 82 of terminal 80 to secure the terminal against rearward movement of the terminal. The resilient nature of wall sections 18 will also tend to hold the terminal against lateral movement, being spring biased against the terminal. Each wall section 18 has an inside surface 22, an outside surface 24 and side surfaces 26.

Wafer portion 10 also preferably has forwardly extending projections 34 along the outside perimeter of planar section 12. Projections 34 are coterminous and extend slightly farther forward than ends 20 of wall section 18 and engage a rearwardly facing stop shoulder inside the connector housing a positioning the retention article of the present invention within the housing, as is more clearly shown in Figure 5. Alternatively, surface 64 of connector housing 60 could have rearwardly extending projections having ends which engage planar section 12 of wafer portion

10 proximate sides thereof; or small projections from side 66 of large cavity 62 could be so located to engage planar section 12 forwardly thereof.

Figure 2 shows a retention assembly 40 formed by retention wafer portion 10 having elastomeric material 38 overmolded around it with a first portion forward of planar section 12 and a second portion rearward thereof. Large retention tines 14 of wafer portion 10 extend outward from assembly 40, and holes 42 (see in Figure 4) are formed in the second portion of elastomeric material 38 such as during the overmolding process to be aligned with holes 16 of wafer portion 10 such that a terminal 80 may be inserted completely therethrough. Assembly 40 has a ledge 44 peripherally mostly therearound at its rearward end 46, opposing parallel sidewalls 48 and opposing parallel end walls 50 each having a slightly beveled perimeter 52 proximate forward end 54, which may be flush with coterminous ends 20 of wall sections 18 of wafer portion 10. Elastomeric material 38 may be silicone rubber or the like which provides spring force to tines 14 and wall sections 18 and also is expandable when urged by an extraction tool from within a hole 42.

Where centerlines of holes 16 are to be closely spaced such as at a distance of 0.127 cm. therebetween, and the holes are to be aligned in rows, one spacing pattern which provides for the narrowest distance between rows alternates the holes in a diagonal W-pattern. Thus, referring now to Figure 3, holes 16a and 16b within the same row are 0.127 cm. apart at their centers, and hole 16c in the other row is also 0.127 cm. from either 16a or 16b, even though the rows of centers are less than 0.127 cm. apart. The formation and placement of wall sections 18 around holes 16 in such a hole pattern should be such that wall sections 18 do not interfere with each other and yet extend a significant angular distance around each hole 16 with as thick a base as possible. A narrow wall 28 separates any two adjacent holes 16, and wall 28 has a thickness at its narrowest point 30 (on a line between the centers of such holes) which equals the centerline separation less twice the radius of a hole 16. For example, if the radius of a hole 16 is 0.05 cm. and the centerline separation is 0.127 cm, the thickness of wall 28 at point 30 is 0.127 cm. The bases of wall sections 18 extending forward from such a point 30 have a thickness which preferably is equal to but not less than this thickness of wall 28.

In Figure 3, wall section 18a is associated with hole 16a and is disposed at its lower left; wall section 18b with hole 16b, at its upper right; and wall section 18c with hole 16c, at its upper left. Side surface 26a of wall section 18a is preferably in a plane parallel to that of side surface 26b of wall section 18b, and near the bases thereof side surfaces 26a and 26b are joined together along a small triangular-shaped joint 32 which extends forwardly from point 30. Such joining adds some structural strength to retention wafer 10 and does not noticeably interfere with the expanding of the wall sections 18 upon insertion of terminals. A

reverse S-shape is formed by the outline of wall sections 18a and 18b at their bases.

Wall section 18c has a side surface 26c which meets outside surface 24a of wall section 18a at their respective bases in the middle of wall section 18a; this does not diminish the utility of either of the wall sections involved. This pattern of each hole 16 in the one row having wall sections disposed on upper right and lower left quadrants, and in the other row having wall sections disposed on lower right and upper left quadrants, is believed to provide the optimum disposition of such wall sections 18 for the densest spacing of terminals in the retention article of the present invention. If the rows of terminals need not be so close together, it is within the scope of the invention that wall sections 18 be disposed about holes 16 in one row without respect to the disposition of wall sections about holes in any other row. It can be seen that more than two rows of terminals can be provided for by having more than two rows of holes 16 in the retention article of the invention. It is also within the scope of the invention that holes 16 not be necessarily located in definite rows at all, so long as wall sections 18 of adjacent holes are sufficiently clear from one another to be expanded individually upon insertion of a terminal.

Figure 4 shows assembly 40 with elastomeric material 38 overmolded around retention wafer portion 10, and holes 42 extend from rearward end 46 to forward end 54, through holes 16 of wafer portion 10. Holes 42 preferably have diameters no larger than the conductors to which terminals 80 are connected, as is discussed hereinbelow.

During the overmolding process core pins (not shown) are located within the mold to create holes 42. Each core pin preferably has conical head engaging inside surfaces 22 of frustoconical wall sections 18 of each hole 16 of wafer portion 10, an elastomeric material 38 is molded adjacent to and around the conical heads of the core pins between side surfaces 26 of wall sections 18 forming inner arcuate surfaces 36 which extend between inside surfaces 22 of wall sections 18 to form a continuous frustoconical surface, resulting in the structure of assembly 40 as seen in Figure 2. Thus a single frustoconical surface is formed around the front end of each hole 16 which includes inside surfaces 22 and inner arcuate surfaces 36. Preferably during the overmolding process a bonding agent is used so that elastomeric material 38 is adhered to plastic wafer portion 10. Such bonding of materials is especially important between elastomeric material 38 and wafer portion 10 around the side surfaces 26 and the outside surfaces 24 of wall sections 18 after insertion of terminals 80 into assembly 40 and during later removal thereof, as is discussed hereinbelow.

As shown in Figure 5, an assembly 40 is secured within a large rearward cavity 62 of each one of a mating pair of dielectric connector

housings 60 (for plug terminals) and 160 (for socket terminals). It is preferred that a small gap be kept between forward end 64 of housing 60 and forward surface 54 of assembly 40 (which includes ends 20 of wall section 18) to allow for slight localized expansion of forward surface 54 and ends 20 when terminals are inserted (as can be seen in Figure 8 where the terminal is being removed). Such gap can be assured by projections 34, or by rearward projections from forward cavity end 64, or by projections from sidewalls 66 of cavity 62 as aforesaid. Projections 34 of assembly 40 engage forward end 64 of large cavity 62, forward end 64 acting as a stop surface stopping forward movement of assembly 40.

Each large cavity 62 of housings 60, 160 has sidewalls 66 having recesses 68 therein whereinto retention tines 14 extending from sides of assembly 40 will be disposed upon insertion. During insertion of assembly 40 into housing 60, tines 14 are urged inwardly by sidewalls 66 of large cavity 62 and slide along sidewalls 66 until assembly 40 is fully seated in large cavity 62. Then tines 14 assisted by spring force of adjacent elastomeric material 38, are urged outwardly into recesses 68. An end of each tine 14 engages a forwardly-facing wall 70 of each recess 68 which together act as cooperating stop surfaces. Elastomeric material 38 along the inside surface of each tine 14 gives spring-like support to urge tine 14 outward, while allowing tines 14 to be flexed inwardly during insertion of assembly 40 into large cavity 62 of housing 60. It can be seen that large retention tines 14 allow retention assembly 40 to be self-retaining within housing 60, although adhesive material could be used to assure retention. Ledge 44 of assembly 40 engages rear surface 72 of housing 60, and can be seen to be dimensioned larger than large cavity 62 whereas assembly 40 generally is just slightly smaller than or possibly equal to the inside dimensions of large cavity 62.

Terminal 80 secured in hole 42, 16 is shown with contact section 84 extending forward of assembly 40 and being disposed in terminal-receiving cavity 74 of housing 60 with which hole 42, 16 is aligned, and forward stop shoulder 86 of terminal 80 engages rearwardly-facing stop shoulder 76 of housing 60 to stop forward movement of terminal 80. Conductor-receiving section 88 of terminal 30 has been terminated to a conductor 90, and both conductor-receiving section 88 and an end portion of conductor 90 are secured within assembly 40 with ends 20 of wall sections 18 of wafer portion 10 engaging rearwardly-facing stop surface of stop shoulder 82 of terminal 80. Mating shells 100, 110 are shown disposed around housings 60, 160 respectively which are securable together.

During insertion of a terminal 80 into an assembly 40, contact section 84 urges wall sections 18 of hole 42, 16 apart, and likewise urges apart elastomeric material 38 extending between wall sections 18, until stop shoulder 82 passes ends 20 of wall sections 18. Spring-like wall

sections 18, assisted by spring force of the surrounding elastomeric material 38, then tend to return to their normal unexpanded condition rearward of stop shoulder 82 and engage terminal 80 with some gripping force therearound. Elastomeric material 38 could be said to act as a tight collar around outside surfaces 24 of wall sections 18. If elastomeric material 38 is bonded to wafer portion 10 especially around wall sections 18 such as by using a bonding agent, the possibility of separation therebetween and resulting problems (especially during later removal of terminals 80) is minimized.

With the present invention it is possible to individually remove and replace terminals 80 which may be done in the following manner, with reference to Figures 7 and 8. Extraction tool 200 (illustrated in Figure 6) is shown in the process of being inserted, first partially as in Figure 7, then fully as in Figure 8 from rearward end 46 along a conductor 90 within a hole 42, 16. (Figures 7 and 8 are along a terminal 80 retained in assembly 40 within a housing 60 and are taken at a typical angle through opposing wall sections 18). A pair of long, thin arcuate metal arms 210 of tool 200 form nearly a circumferential barrel having an effective diameter just less than that of hole 16 and equal to that of stop shoulder 82 of terminal 80. Arms 210 are designed to be slightly adaptable in diameter. Arms 210 are placed around conductor 90 rearward of connector housing 60 and are manually urged forwardly along conductor 90 entering hole 42 at rearward end 46 of retention assembly 40 slightly urging apart elastomeric material 38. Continuing forward, arms 210 enter through hole 16 of wafer portion 10 and around terminal 80 eventually engaging inside surfaces 22 of wall sections 18 (and inner arcuate surfaces 36 of elastomeric material 38 between inside surfaces 22), urging them apart. Arms 210 continue forward until reaching and engaging stop shoulder 82.

Terminal 80 may now be removed along with arms 210 of tool 200 by gripping conductor 90 and withdrawing or pulling conductor 90 and tool 200 rearward. To minimize problems resulting from possible snagging of ends 20 by any portion of terminal 80, it is preferable that outside surfaces 24 and side surfaces 26 of wall section 18 be bonded by a bonding agent to elastomeric material 38 which bonding now acts to prevent wall sections 18 from separating from material 38 and being pulled rearward by terminal 80. A new terminal may now be inserted replacing terminal 80 without having disturbed other terminals or having required disengaging the mating connectors such as is required in some cases for insertion of the extraction tool from the front of the connector, or even worse, having to replace the entire connector because of one terminal needing replacing.

Optionally, ledge 44 may have a forwardly extending ridge (not shown) at its outer periphery to effect a better sealing engagement with rear surface 72 of housing 60.

The present invention may be used for retention of terminals even more closely spaced than 0.127 cm (0.050 inch) centerlines as in the example given herein. Other thermoplastic and elastomeric materials may be used to form the retention article of the present invention, and while overmolding is the preferred method of forming the retention article of the present invention, other methods may be used such as bonding a premolded elastomeric portion rearward of planar section 12, and either overmolding or bonding a premolded elastomeric portion forward of planar section 12 around wall sections 18.

Claims

1. An article (40) for retaining terminals within a housing (60) of an electrical connector, being insertably secured in the connector and having a planar section (12) and a plurality of holes (16) extending therethrough each to secure therein a said terminal (80) terminated to an electrical conductor (90), wherein opposing frustoconical wall sections (18) extend partially around each hole (16) and forwardly therefrom partly converging, the wall sections having stop surfaces on forward ends (20) thereof for engaging a rearwardly-facing stop surface of a stop shoulder (82) of a terminal (80) inserted therethrough, characterized in that:

a first portion of elastomeric material (38) extends forward from said planar section (12) and surrounds outside surfaces (24) of the wall sections (18) around the holes (16); and

a second portion of elastomeric material (38) extends rearwardly from the planar section (12) with holes (42) aligned with holes (16) extending therethrough to a rearward end (46) of the article into which the terminals (80) are insertable, conductors (90) being disposed along holes (42).

2. An article (40) as set forth in claim 1 further characterized in that said wall sections (18) each extend around the circumference of an associated hole (16) an angular distance of from 60° to 120°.

3. An article (40) as set forth in any of the preceding claims further characterized in that said first portion of elastomeric material (38) engages side surfaces (26) of said wall sections (18) and extends between said side surfaces (26) arcuately around the hole (16), forming in combination with inside surfaces (22) of wall sections (18) a continuous frustoconical surface (22, 36) at a forward end of said hole (16).

4. An article (40) as set forth in any of the preceding claims further characterized in that large retention tines (14) extend rearwardly from sides of said planar section (12) of said wafer-like portion (10) and extend slightly outwardly such that end surfaces thereof engage respective forwardly-facing stop surfaces (70) in the connector housing (60), and the second portion of elastomeric material (38) engages inside surfaces of the large retention tines (14).

5. An article (40) as set forth in any of the preceding claims further characterized in that



sections 18, assisted by spring force of the surrounding elastomeric material 38, then tend to return to their normal unexpanded condition rearward of stop shoulder 82 and engage terminal 80 with some gripping force therearound. Elastomeric material 38 could be said to act as a tight collar around outside surfaces 24 of wall sections 18. If elastomeric material 38 is bonded to wafer portion 10 especially around wall sections 18 such as by using a bonding agent, the possibility of separation therebetween and resulting problems (especially during later removal of terminals 80) is minimized.

With the present invention it is possible to individually remove and replace terminals 80 which may be done in the following manner, with reference to Figures 7 and 8. Extraction tool 200 (illustrated in Figure 6) is shown in the process of being inserted, first partially as in Figure 7, then fully as in Figure 8 from rearward end 46 along a conductor 90 within a hole 42, 16. (Figures 7 and 8 are along a terminal 80 retained in assembly 40 within a housing 60 and are taken at a typical angle through opposing wall sections 18). A pair of long, thin arcuate metal arms 210 of tool 200 form nearly a circumferential barrel having an effective diameter just less than that of hole 16 and equal to that of stop shoulder 82 of terminal 80. Arms 210 are designed to be slightly adaptable in diameter. Arms 210 are placed around conductor 90 rearward of connector housing 60 and are manually urged forwardly along conductor 90 entering hole 42 at rearward end 46 of retention assembly 40 slightly urging apart elastomeric material 38. Continuing forward, arms 210 enter through hole 16 of wafer portion 10 and around terminal 80 eventually engaging inside surfaces 22 of wall sections 18 (and inner arcuate surfaces 36 of elastomeric material 38 between inside surfaces 22), urging them apart. Arms 210 continue forward until reaching and engaging stop shoulder 82.

Terminal 80 may now be removed along with arms 210 of tool 200 by gripping conductor 90 and withdrawing or pulling conductor 90 and tool 200 rearward. To minimize problems resulting from possible snagging of ends 20 by any portion of terminal 80, it is preferable that outside surfaces 24 and side surfaces 26 of wall section 18 be bonded by a bonding agent to elastomeric material 38 which bonding now acts to prevent wall sections 18 from separating from material 38 and being pulled rearward by terminal 80. A new terminal may now be inserted replacing terminal 80 without having disturbed other terminals or having required disengaging the mating connectors such as is required in some cases for insertion of the extraction tool from the front of the connector, or even worse, having to replace the entire connector because of one terminal needing replacing.

Optionally, ledge 44 may have a forwardly extending ridge (not shown) at its outer periphery to effect a better sealing engagement with rear surface 72 of housing 60.

The present invention may be used for retention of terminals even more closely spaced than 0.127 cm (0.050 inch) centerlines as in the example given herein. Other thermoplastic and elastomeric materials may be used to form the retention article of the present invention, and while overmolding is the preferred method of forming the retention article of the present invention, other methods may be used such as bonding a premolded elastomeric portion rearward of planar section 12, and either overmolding or bonding a premolded elastomeric portion forward of planar section 12 around wall sections 18.

Claims

1. An article (40) for retaining terminals within a housing (60) of an electrical connector, being insertably secured in the connector and having a planar section (12) and a plurality of holes (16) extending therethrough each to secure therein a said terminal (80) terminated to an electrical conductor (90), wherein opposing frustoconical wall sections (18) extend partially around each hole (16) and forwardly therefrom partly converging, the wall sections having stop surfaces on forward ends (20) thereof for engaging a rearwardly-facing stop surface of a stop shoulder (82) of a terminal (80) inserted therethrough, characterized in that:

a first portion of elastomeric material (38) extends forward from said planar section (12) and surrounds outside surfaces (24) of the wall sections (18) around the holes (16); and

a second portion of elastomeric material (38) extends rearwardly from the planar section (12) with holes (42) aligned with holes (16) extending therethrough to a rearward end (46) of the article into which the terminals (80) are insertable, conductors (90) being disposed along holes (42).

2. An article (40) as set forth in claim 1 further characterized in that said wall sections (18) each extend around the circumference of an associated hole (16) an angular distance of from 60° to 120°.

3. An article (40) as set forth in any of the preceding claims further characterized in that said first portion of elastomeric material (38) engages side surfaces (26) of said wall sections (18) and extends between said side surfaces (26) arcuately around the hole (16), forming in combination with inside surfaces (22) of wall sections (18) a continuous frustoconical surface (22, 36) at a forward end of said hole (16).

4. An article (40) as set forth in any of the preceding claims further characterized in that large retention tines (14) extend rearwardly from sides of said planar section (12) of said wafer-like portion (10) and extend slightly outwardly such that end surfaces thereof engage respective forwardly-facing stop surfaces (70) in the connector housing (60), and the second portion of elastomeric material (38) engages inside surfaces of the large retention tines (14).

5. An article (40) as set forth in any of the preceding claims further characterized in that



projections (34) extend forwardly from sides of planar section (12) of wafer-like portion (10) and extend farther forward than said wall sections (18) to engage a rearwardly-facing surface (64) of connector housing (60) to stop forward movement of article (40) during insertion of article (40) in a large rearward cavity (62) of connector housing (60).

6. An article (40) as set forth in any of the preceding claims further characterized in that holes (42) extending through the second portion of elastomeric material (38) are slightly smaller in diameter than the diameters of conductors (90) therein, whereby the elastomeric material (38) grips conductors (90).

7. An article (40) as set forth in any of the preceding claims further characterized in that the rearward end (46) of article (40) has a peripheral ledge (44) therearound to engage a rearward surface (72) of the connector housing (60).

8. An article (40) as set forth in any of the preceding claims further characterized in that elastomeric material (38) is overmolded around said wafer-like portion (10) to form said first and second portions.

9. An article (40) as set forth in any of the preceding claims further characterized in that the elastomeric material (38) is bonded to the wafer-like portion (10).

10. An article (40) as set forth in any of the preceding claims further characterized in that holes (16, 42) are closely spaced.

11. An article (40) as set forth in any of the preceding claims further characterized in that the article (40) is secured in large rearward cavity (62) of connector housing (60) prior to insertion of terminals (80) thereinto.

12. A method of forming a retention article (4) as claimed in claim 1 securable in a connector housing (60) for retaining electrical terminals (80) therein comprising the steps of:

forming a wafer-like article (10) of thermoplastic material, said article having a planar section (12) having holes (16) therethrough and opposing wall sections (18) associated with and extending partially around each said hole (16), said wall sections (18) extending forwardly from said planar section (12) and partly converging at forwardly-facing end surface (20) thereof;

inserting into a mold said wafer-like article (10) and a plurality of core pins extending through the holes (16) in said articles (10); and

overmolding said wafer-like article (10) with elastomeric material (38), thus forming a first portion of elastomeric material (38) forwardly of said planar section (12) such that said first portion surrounds outside surfaces (24) of said wall sections (18) around said holes (16), and a second portion of elastomeric material (38) rearwardly of said planar section (12) such that said second portion has holes (42) extending therethrough formed by the core pins and aligned with said holes (16) in said planar section (12).

13. A method as set forth in claim 12 wherein each said core pin has a conical head disposed

adjacent inside surfaces (22) of said wall sections (18) associated with each said hole (16) of said wafer-like article (10), and said elastomeric material (38) is molded around said wafer-like article (10) and said core pins, forming said retention article (40) such that the forward end of each said hole (16) has a continuous frustoconical inside surface (22, 36).

Patentansprüche

1. Artikel (40) zum Festhalten von Anschlüssen innerhalb eines Gehäuses (60) eines elektrischen Verbinders, wobei der Artikel in dem Verbinder einsteckbar befestigt ist und einen planaren Abschnitt (12) sowie eine sich durch diesen hindurcherstreckende Mehrzahl von Öffnungen (16) aufweist, in denen jeweils ein an einen elektrischen Leiter (90) angeschlossener Anschluß (80) befestigbar ist, wobei einander gegenüberliegende kegelstumpfförmige Wandabschnitte (18) sich teilweise um jede Öffnung (16) herum und sich von dieser teilweise konvergierend nach vorne erstrecken, wobei die Wandabschnitte an vorderen Enden (20) Anschlagflächen zum Angreifen an einer nach hinten weisenden Anschlagfläche einer Anschlagschulter (82) eines durch diese hindurch eingeführten Anschlusses (80) aufweisen,

dadurch gekennzeichnet, daß sich ein erster Bereich aus elastomerem Material (38) von dem planaren Abschnitt (12) nach vorne erstreckt und Außenflächen (24) der Wandabschnitte (18) um die Öffnungen (16) herum umgibt; und

daß sich ein zweiter Bereich aus elastomerem Material (38) von dem planaren Abschnitt (12) nach rückwärts erstreckt, wobei sich mit dem Öffnungen (16) ausgerichtete Öffnungen (42) durch diesen Bereich hindurch zu einem rückwärtigen Ende (46) des Artikels erstrecken, in das die Anschlüsse (80) einführbar sind, wobei die Leiter (90) längs der Öffnungen (42) angeordnet sind.

2. Artikel (40) nach Anspruch 1, weiterhin dadurch gekennzeichnet, daß sich die Wandabschnitte (18) jeweils über eine Winkelstrecke von 60° bis 120° um den Umfang einer zugeordneten Öffnung (16) herumerstrecken.

3. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß der erste Bereich aus elastomerem Material (38) an Seitenflächen (26) der Wandabschnitte (18) angreift und sich zwischen den Seitenflächen (26) in bogenförmig gekrümmter Weise um die Öffnung (16) erstreckt und in Kombination mit Innenflächen (22) der Wandabschnitte (18) eine kontinuierliche kegelstumpfförmige Oberfläche (22, 36) an einem vorderen Ende der Öffnung (16) bildet.

4. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß sich große Festhaltezipfen (14) von Seiten des planaren Abschnitts (12) des plattenartigen Bereichs (10) nach rückwärts erstrecken und sich geringfügig nach außen erstrecken, so daß Endflächen derselben an jeweiligen, nach vorne wei-



senden Anschlagflächen (70) in dem Verbindergehäuse (60) angreifen, und daß der zweite Bereich aus elastomerem Material (38) an Innenflächen der großen Festhaltezinken (14) angreift.

5. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß sich Vorsprünge (34) von Seiten des planaren Abschnitts (12) des plattenartigen Bereichs (10) nach vorne erstrecken und sich weiter als die Wandabschnitte (18) nach vorne erstrecken, damit sie an einer nach hinten weisenden Fläche (64) des Verbindergehäuses (60) angreifen, um die Vorwärtsbewegung des Artikels (40) während des Einsetzens des Artikels (40) in einen großen rückwärtigen Hohlraum (62) des Verbindergehäuses (60) zu stoppen.

6. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß die sich durch den zweiten Bereich aus elastomerem Material (38) hindurcherstreckenden Öffnungen (42) einen geringfügig kleineren Durchmesser als die Durchmesser der darin befindlichen Leiter (90) aufweisen, wodurch das elastomere Material (38) die Leiter (90) ergreift.

7. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß das rückwärtige Ende (46) des Artikels (40) eine sich um dieses erstreckende umfangsmäßige Leiste (44) zum Angreifen an einer rückwärtigen Fläche (72) des Verbindergehäuses (60) aufweist.

8. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß das elastomere Material (38) zur Bildung des ersten und des zweiten Bereichs um den plattenartigen Bereich (10) herum auf diesen aufgeformt ist.

9. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß das elastomere Material (38) mit dem plattenartigen Bereich (10) haftend verbunden ist.

10. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß die Öffnungen (16, 42) in enger Beabstandung voneinander vorgesehen sind.

11. Artikel (40) nach einem der vorausgehenden Ansprüche, weiterhin dadurch gekennzeichnet, daß der Artikel (40) in dem großen rückwärtigen Hohlraum (62) des Verbindergehäuses (60) befestigt wird, bevor die Anschlüsse (80) in diesen eingeführt werden.

12. Verfahren zum Bilden eines Festhalteartikels (4) nach Anspruch 1, der in einem Verbindergehäuse (60) zum Festhalten elektrischer Anschlüsse (80) in diesem befestigbar ist, wobei das Verfahren folgende Schritte umfaßt:

Bildung eines plattenartigen Artikels (10) aus thermoplastischem Material, wobei der Artikel einen planaren Abschnitt (12) mit sich durch diesen hindurcherstreckenden Öffnungen (16) sowie einander entgegengesetzten Wandabschnitten (18) aufweist, die jeder Öffnung (16) zugeordnet sind und sich teilweise um diese herumerstrecken, wobei sich die Wandab-

schnitte (18) von dem planaren Abschnitt (10) nach vorne erstrecken und an nach vorne weisenden Endflächen (20) desselben teilweise konvergieren;

Einsetzen des plattenartigen Artikels (10) und einer Mehrzahl von sich durch die Öffnungen (16) in dem Artikel (10) hindurcherstreckenden Kernstiften in eine Form; und

Überformen des plattenartigen Artikels (10) mit elastomerem Material (38) und dadurch erfolgende Bildung eines ersten Bereichs aus elastomerem Material, der sich vor dem planaren Abschnitt (12) befindet, derart daß der erste Bereich Außenflächen (24) der Wandabschnitte (18) um die Öffnungen (16) herum umgibt, sowie eines zweiten Bereichs aus elastomerem Material (38), der sich rückwärts von dem planaren Abschnitt (12) befindet, derart daß der zweite Bereich sich durch diesen hindurcherstreckende Öffnungen (42) aufweist, die durch die Kernstifte gebildet werden und mit den Öffnungen (16) in den planaren Abschnitt (12) ausgerichtet sind.

13. Verfahren nach Anspruch 12, dadurch gekennzeichnet, daß jeder Kernstift einen konischen Kopf aufweist, der angrenzend an die Innenfläche (22) der jeder der Öffnungen (16) des plattenartigen Artikels (10) zugeordneten Wandabschnitte (18) angeordnet wird, und daß das elastomere Material (38) um den plattenartigen Artikel (10) und die Kernstifte herumgeformt wird, wodurch der Festhalteartikel (40) derart gebildet wird, daß das vordere Ende jeder Öffnung (16) eine kontinuierliche kegelförmige Innenfläche (22, 36) aufweist.

Revendications

1. Pièce (40) pour retenir des bornes à l'intérieur d'un boîtier (60) d'un connecteur électrique, pouvant être insérée et fixée dans le connecteur et comportant une partie plane (12) traversée de plusieurs trous (16) dans chacun desquels une borne (80), terminant un conducteur électrique (90), peut être fixée, des parties de parois tronconiques opposées (18) s'étendant partiellement autour de chaque trou (16) et vers l'avant de celui-ci, en convergeant partiellement, les parties de parois ayant sur leurs extrémités avant (20) des surfaces de butée destinées à porter contre une surface de butée, tournée vers l'arrière, d'un épaulement de butée (82) des bornes (80) qui y est inséré, caractérisée en ce que:

une première portion en matière élastomérique (38) s'étend vers l'avant de ladite partie plane (12) et entoure des surfaces extérieures (24) des parties de parois (18) autour des trous (16); et

une seconde portion de matière élastomérique (38) s'étend vers l'arrière de la partie plane (12), cette seconde portion étant traversée de trous (42) alignés avec les trous (16) jusqu'à une extrémité arrière (46) de la pièce dans laquelle les bornes (80) peuvent être insérées, des



conducteurs (90) étant disposés le long des trous (42).

2. Pièce (40) selon la revendication 1, caractérisée en outre en ce que lesdites parties de parois (18) s'étendent chacune le long de la circonférence d'un trou associé (16) sur une distance angulaire de 60° à 120°.

3. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que ladite première portion de matière élastomérique (38) porte contre les surfaces latérales (26) desdites parties de parois (18) et s'étend entre lesdites surface latérales (26) de façon incurvée autour du trou (16), formant, en combinaison avec des surfaces intérieures (22) des parties de paroi (18), une surface tronconique continue (22, 36) à une extrémité avant dudit trou (16).

4. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que de grandes dents (14) de retenue s'étendent vers l'arrière à partir des côtés de ladite partie plane (12) de ladite portion (10) analogue à une gaufrette et s'étendent légèrement vers l'extérieur afin que des surfaces extrêmes des dents portent contre des surfaces respectives (70) de butée, tournées vers l'avant, situées dans le boîtier (60) du connecteur, et la seconde portion de matière élastomérique (38) porte contre des surfaces intérieures des grandes dents (14) de retenue.

5. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que des saillies (34) partent vers l'avant de côtés de la partie plane (12) de la portion (10) analogue à une gaufrette et s'étendent davantage vers l'avant que lesdites parties de paroi (18) pour porter contre une surface (64), tournée vers l'arrière, du boîtier (60) du connecteur afin d'arrêter un mouvement de la pièce (40) vers l'avant pendant l'insertion de la pièce (40) dans une grande cavité (62), tournée vers l'arrière, du boîtier (60) du connecteur.

6. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que des trous (42) s'étendant à travers la seconde portion de matière élastomérique (38) sont d'un diamètre légèrement inférieur aux diamètres de conducteurs (90) disposés dans ces trous, de manière que la matière élastomérique (38) enserme les conducteurs (90).

7. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que l'extrémité arrière (46) de la pièce (40) est entourée d'un rebord périphérique (44) destiné à porter contre une surface (72), tournée vers l'arrière, du boîtier (60) de connecteur.

8. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que la matière élastomérique (38) est surmoulée autour de la portion (10) analogue à une gaufrette

pour former lesdites première et seconde portions.

9. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que la matière élastomérique (38) est liée à la portion (10) analogue à une gaufrette.

10. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que les trous (16, 42) sont étroitement rapprochés.

11. Pièce (40) selon l'une quelconque des revendications précédentes, caractérisée en outre en ce que la pièce (40) est fixée dans une grande cavité (62) tournée vers l'arrière du boîtier (60) du connecteur avant que des bornes (80) y soient insérées.

12. Procédé pour former une pièce (4) de retenue selon la revendication 1, pouvant être fixée dans un boîtier (60) de connecteur pour y retenir des bornes électriques (80), comprenant les étapes que consistent:

à former une pièce (10) analogue à une gaufrette en matière thermoplastique, ladite pièce ayant une partie plane (12) traversée de trous (16) et des parties de parois opposées (18) associées à et s'étendant partiellement autour de chacun desdits trous (16), lesdites parties de parois (18) s'étendant vers l'avant de ladite partie plane (12) et convergeant partiellement à leurs surfaces extrêmes (20) tournées vers l'avant;

à insérer dans un moule ladite pièce (10) analogue à une gaufrette et plusieurs broches de noyaux s'étendant dans les trous (16) de ladite pièce (10); et

à surmouler ladite pièce (10) analogue à une gaufrette avec une matière élastomérique (38), formant ainsi une première portion de matière élastomérique (38) vers l'avant de ladite partie plane (12) afin que ladite première portion entoure des surfaces extérieures (24) desdites parties de paroi (18) autour desdits trous (16), et une seconde portion de matière élastomérique (38) en arrière de ladite partie plane (12) afin que ladite seconde portion soit traversée de trous (42) formés par les broches de noyaux et alignés avec lesdits trous (16) de ladite partie plane (12).

13. Procédé selon la revendication 12, dans lequel chacune desdites broches de noyaux comporte une tête conique disposée à proximité immédiate des surfaces intérieures (22) desdites parties de parois (18) associées à chacun desdits trous (16) de ladite pièce (10) analogue à une gaufrette, et ladite matière élastomérique (38) est moulée autour de ladite pièce (10) analogue à une gaufrette et lesdites broches de noyaux, formant ladite pièce (40) de retenue de manière que l'extrémité avant de chacun desdits trous (16) présente une surface intérieure tronconique continue (22, 36).